REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1, 3-4, 8, 10, 12, 15-28 are currently pending, Claims 1, 10, 12, and 27-28 amended and Claims 7, 11, 13-14 and 29-30 canceled by way of the present amendment.

Claims 1, 3-4, 7-8, 10-23, and 27-30 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,545,245 to Yeh et al. in view of patent Application Serial No. 2004/0109263 to Suda et al. and U.S. Patent No. 7,041,608 to Sieber et al. or U.S. Patent No. 6,057,247 to Imai et al..

Turning now to the merits, in order to expedite issuance of a patent in this case, Claims 1, 27 and 28 are amended to clarify the patentable features of the present invention over the cited references. Specifically, Claims 1 recites the method of removing fluoro-carbon polymer chamber residue from a plasma processing system includes introducing a process gas into a process chamber of the plasma processing system, wherein the process gas consists of CO, or CO in combination with inert Ar gas, and maintains a pressure between 10 mTorr and 100 mTorr within the process chamber, generates a plasma from the process gas, and exposes the fluoro-carbon polymer chamber residue to the plasma in a waferless dry cleaning process to form a volatile reaction product from the residue, where a shield wafer is not provided on a substrate holder of the plasma processing system so that the substrate holder is cleaned by the waferless dry cleaning process; and exhausts the reaction product from the process chamber.

Thus, Applicant's independent Claim 1 recites that the process gas "consisting of CO or CO in combination with inert Ar gas," and "maintaining a pressure between 10 mTorr and 100 mTorr." Independent Claims 27 and 28 recite similar features in system and means plus

function claim format. Figures 5-7 of Applicants' specification show a standard Argon plus O_2 plasma as a conventional baseline process to which other processes are compared. Further, curve 6 of Fig. 6 shows improved process results with the removal of O_2 at a process chamber pressure of 100 mTorr. As seen in Fig. 6, the use of O_2 provides acceptable results only in a process operated at the undesirable higher pressure of 600 mTorr. Thus, Applicants' specification explains the benefits of eliminating O_2 from the process gas and in particular shows using CO or CO and Ar gas ***at 100 mTorr***. The Final Office Action admits that the primary reference to Yeh et al. does not disclose the use of CO as a processing gas, but cites Suda et al., Sieber et al., and Imai et al. as teaching the CO/CO_2 limitation previously included in Claims 1, 27, and 28.

As discussed in the Appeal Brief, the cited reference to Suda et al. mentions that the dry etching steps for etching a substrate may be performed using "other gases that contain oxygen, such as CO, CO_2, NO, etc. that can generate oxygen plasma."[1] Thus, by use of the term "etc.," Suda et al. discloses an essentially limitless range of oxygen gases including ***any*** gas containing oxygen and which can be used to generate a plasma for etching a substrate device. However, there is no indication in Suda et al. that using CO in a plasma cleaning process for a semiconductor processing chamber provides any advantage over the broad range of possible gases including oxygen.

Similarly, the cited references to Sieber et al. states that "plasmas containing oxygen process gas for cleaning the fluorocarbon residue may use plasmas containing oxygen or . . . use some combination of gases in the plasma such that fluorine is removed (e.g. in the form of HF) from the fluorocarbon and the remaining carbon-bearing materials oxidized to produce volatile species such as CO and CO_2."[2] Thus, Sieber et al. also discloses that any oxygen containing plasma can be used to process a substrate, and mentions CO only as a

[1] Suda et al. at paragraph [0082].
[2] Sieber et al. at col. 11, lines 10-20.

byproduct of the substrate cleaning process, and not used as the process gas itself. Applicants submit that it would not be obvious for one of ordinary skill in the art to try all possible process gases as suggested by Suda et al. and Sieber et al. to arrive at CO or CO and Ar gas as now claimed. As discussed in Applicants' specification, the present inventors conducted experiments which led to the discovery that use of CO in the claimed process gas provides advantages for cleaning a process chamber. For example, Figures 5-7 of Applicants' specification show superior cleaning results from using a CO plasma. That is, of the many "oxygen containing gases" available, the present inventors discovered that CO process gases provide superior results for cleaning a processing chamber. Suda et al. and Sieber et al. does not teach this feature.

Finally, the cited reference to Imai et al. discloses a method for controlling the environment inside a reaction chamber of a dry etching apparatus. As seen throughout Imai et al., undesirable fluorine is removed from the reaction chamber by generating oxygen plasma in the reaction chamber. In particular, column 19, lines 19-21 of Imai et al. states, "carbon oxide and oxygen gases are introduced into the reaction chamber 107 at respective flow rates of 200 sccm or more and 80 sccm or more (in step S305)." Thus, Imai et al. also does not disclose process gas consisting of CO or CO in combination with inert Ar gas as recited in presently amended independent Claims 1, 27 and 28. Thus, these claims patentably define over the cited references.

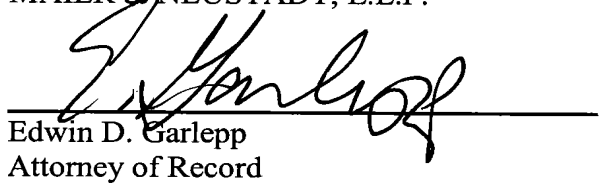
In addition, Claims 1, 27 and 28 recite maintaining a pressure at between 10 mTorr and 100 mTorr within the process chamber. As noted above, Fig. 6 of Applicants' specification shows that use of a CO process gas or CO and Ar process gas at 100 mTorr provides unexpected results over other process gases and over CO and O_2 at 600 mTorr. Thus, even assuming that it would be *prima facie* obvious to try the CO or CO and Ar gas, the data within Applicants' specification rebuts this obviousness conclusion. In this regard,

Applicants note that, in affirming the rejection of the previous claims, the Board of Appeals emphasized that the claims were not limited to the test results of Fig. 6. Applicants respectfully submit that the amendments contained herein clarify a scope that is commensurate with the results shown in Fig. 6.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application and the present application is believed to be in condition for formal allowance. An early and favorable action is therefore respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, L.L.P.



Edwin D. Garlepp
Attorney of Record
Registration No. 45,330

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